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GOLD PRICE AND EXCHANGE RATE- AN ANALYSIS OF LONG RUN RELATIONSHIP

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ABSTRACT
The study investigates the long run relationship between gold price and exchange rate. The main objective of the study is to identify whether there is long run relationship between gold price and exchange rate. The study has evaluated daily data of gold price and exchange rate over a period from July 2011 to June 2014. By applying Augmented Dickey Fuller Unit Root Test, Johansen Co-integration Test and Granger Causality Test the study concluded that there is no causality and no long run relationship between gold price and exchange rate.

INTRODUCTION
Gold is primarily a monetary asset and partly a commodity. Gold has been widely used throughout the world as money, for efficient indirect exchange and to store wealth in hoards. The holders of gold store it in the form of bullion coins or bars as a hedge against the exchange rate, inflation or other economic disruption. It is an effective portfolio diversifier which summarizes the usefulness of gold in terms of modern portfolio management.

In the ancient times there is no market in the world of universal appeal for the gold market but now India is the world's largest gold consumer market. The prices of gold are determined on the basis of demand and supply of gold. The monetary demand for gold has played a significant part in the large swings in gold prices of the past decades. Historically gold was used to back currency in an economic system known as the gold standard a certain weight of gold was given the name of a unit of currency.
The selling of gold from government central bank reserve in the last 1990s depressed gold prices, while the buying of gold for private investment has pushed prices up dramatically in the current financial crises. The rise in gold prices over the past decade falls within a longer cycle in gold prices, which has been driven more by the economies of gold supply. The price of gold is increasing for the last 10 years.

For the long period the United States government set the value of the U.S. dollar so that one troy ounce was equal to $20.67 but on 1934 the dollar was devalued to $35 per troy ounce. By 1961 it was becoming hard to maintain this price, and a pool of us and European banks agreed to manipulate the market to prevent further currency devaluation against increased gold demand. Gold formally re-entered the world's monetary system in 1944 when the Breton woods agreement fixed the entire world's paper currencies in relation to the U.S. dollar which in turn was tied to gold. The agreement was forced until 1971, when President Nixon effectively cancelled it by ending the convertibility of the dollar into gold.

The Reserve Bank of India (RBI) is a central bank of India; it monitors the domestic gold market. RBI itself reserves gold for safety against economic downturn. RBI also plays an important role in controlling inflation by changing Repo and Reverse Repo rates. As RBI is a common regulatory body which monitor both gold price and inflation; therefore it is important to investigate relationship among gold price, exchange rate and inflation. The problem under study is to examine whether there is long run relationship between gold price and exchange rate.

The objective of the study is to analysis whether there is any long run relation between gold price and exchange

LITERATURE REVIEW
The research studying relating to the relationship between gold price and exchange has been started from 1970 onwards. In the previous studies the calculations are done on the basis of time series analysis using econometric model. The studies included in this group are the affect of gold price and exchange rate.

Koutsoyiannis (1983) [(1)]Research found that the gold prices are affected by the USA economy rather than worldwide economic conditions. It is stated that US dollar is the Exchange rate providing the international liquidity, gold prices are expressed in US dollars and raw oil prices are quoted in US dollars. Therefore, a negative relationship between US dollar and gold price is found.

Ai Han Shanying Xu and Shouyang Wang (2008)[(2)] In their paper proposes an interval method to explore the relationship between the exchange rate of Australian dollar against US dollar and the gold price, using weekly, monthly and quarterly data,

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traditional econometric models are employed to capture the relationships between the AUS/USD exchange rate and the gold price. In the presence of volatility in time series data, they propose to use interval sample data rather than point ones. The empirical results indicate that the ILS estimates well characterize how the AUS/USD exchange rate relates to the gold price, both in the long-run and the short-run.

Kim and Dilts(2011)[3] In their paper investigates the relationship between the value of the dollar and the prices of two commodities, gold and oil. Granger causality is used on monthly data from January of 1970 through July of 2008. The empirical results show the hypothesis that there is no causal relation between the value of the dollar and the price of gold and oil. There are causal relations between each of the prices, and there is a negative relation between the value of the dollar and the price of each of the commodities, as predicted by standard economic theory. The implication is that gold and oil represent safe havens from fluctuations in the value of the dollar.

***Mashayekhi et al* (2013)**[4]The study is made on the uncertainty and volatility of the gold market, gold excitement and lack of a correct analysis of the market trends with reference to the probable factors which affect the gold price. In this study the researcher investigate and analyze the trend of gold prices over the past five years in Iran . The main focus of research is on the relationship between gold price and free market rate of Dollar in relation to other economic variable. The results indicate that gold price is affected from exchange rates' fluctuations and gold global rate, it is also noteworthy to mention that the most important factors affecting the recent volatility in the Iran's gold market and the exchange rate is the economic sanctions which have been imposed against Iran.

Patel (2013)[5] the study investigates the role of gold as a strategic prophecy against inflation and exchange rate. The main research question of the present study is whether gold has acted as a hedge against inflation and exchange rate for India. Study has evaluated monthly data of gold price, inflation and exchange rate over the period January 1991 to September 2012. By applying Augmented Dickey Fuller unit root test, Johansen Co-integration test and Granger Causality test in Error Correction Model framework, study concludes that Gold Price and Exchange rate are I (1) and Inflation is I (2). It also concludes that there exists long run equilibrium relation among all three variables. However, study provides evidence of no Granger Causality among these variables. By applying ARCH-LM test, heteroskedasticity was detected and Gold price can be modeled as GARCH (1, 1). A negative relationship was found between gold and inflation which suggests that gold acts as an internal hedge against inflation for India. Major implication of this study is that Indian investor should prefer gold investment in the time of inflation boom.

DATA AND METHODOLOGY

The study is to examine whether there is long run relationship between the gold price and exchange rate on the basis of secondary data. The data is collected on daily data covering a period of three years from July 2011 to June 2014 for exchange rate and gold price. For the study the data used is rupee per US dollar as a measure of exchange rate and rupee per 10 grams Kerala gold price measure of gold price. Data for the variables are collected from database of Indian economy maintained by reserve bank of India.

METHODOLOGY

Being an internationally traded commodity the domestic price of gold is greatly influenced by exchange rate fluctuations. To see whether this is the case, the present study attempts to analysis the link between fluctuations in domestic gold price and exchange rate fluctuations. Two widely used statistical tools namely granger causality test and Johnson co-integration analysis have been used in the present study. Since the use of time series data involves the problem of spurious correlation. Augmented dickey fuller test have used to determine the stochastic properties of both exchange rate and the gold price. The equation for the dickey fuller test procedure is

$$\Delta y_t = \beta_1 + \beta_2 t + \gamma y_{t-1} + \sum_{i=1}^{n} \alpha_i \Delta y_{t-i} + \varepsilon_t$$

The significant of γ has been determined by Dickey Fuller Statistic tabulated by Dickey and Fuller.
The Granger Causality Test involves estimating the following pair of equations:

$$EX_t = \sum_{i=1}^{n} \alpha_i GP_{t-i} + \sum_{j=1}^{n} \beta_i EX_{t-i} + \varepsilon_{it}$$

$$GP_t = \sum_{i=1}^{n} \lambda_i GP_{t-i} + \sum_{i=1}^{n} \delta_j EX_{t-i} + \varepsilon_{it}$$

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Where EX is the exchange rate and GP is the price of gold. The causality between the two is determined by testing the significance of the coefficient of lagged variables in both equations by using the F statistics.
Johansen procedure involves the use of two test statistics based on the characteristics roots obtained from a P^{th} order VAR namely.

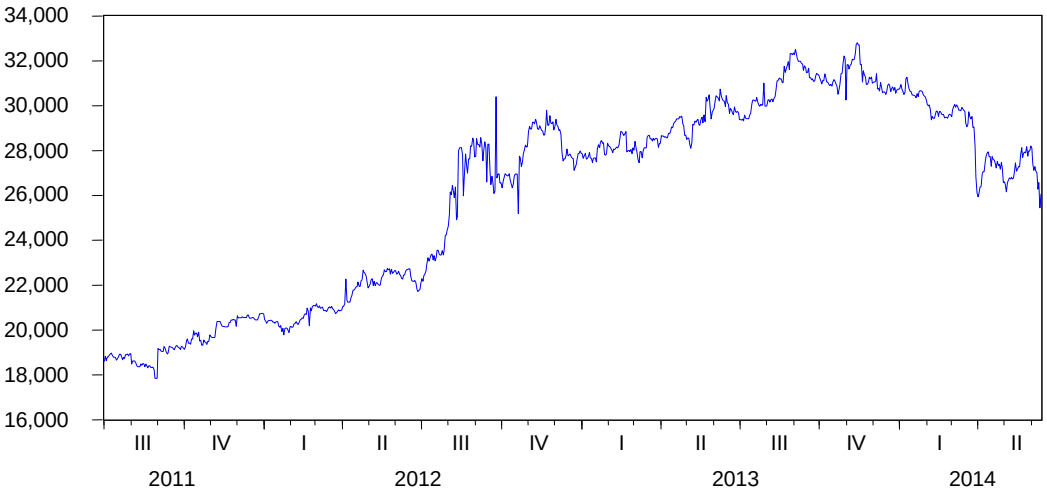
$$\lambda_{trace} = -T \sum_{i=r+1}^{n} l_n(1-\hat{\lambda}_i)$$
$$\lambda_{max} = -T\ l_n(1-\hat{\lambda}_{r+1})$$

A decision regarding the existence of a long run relationship is based on the value of the test statistic obtained from sample.

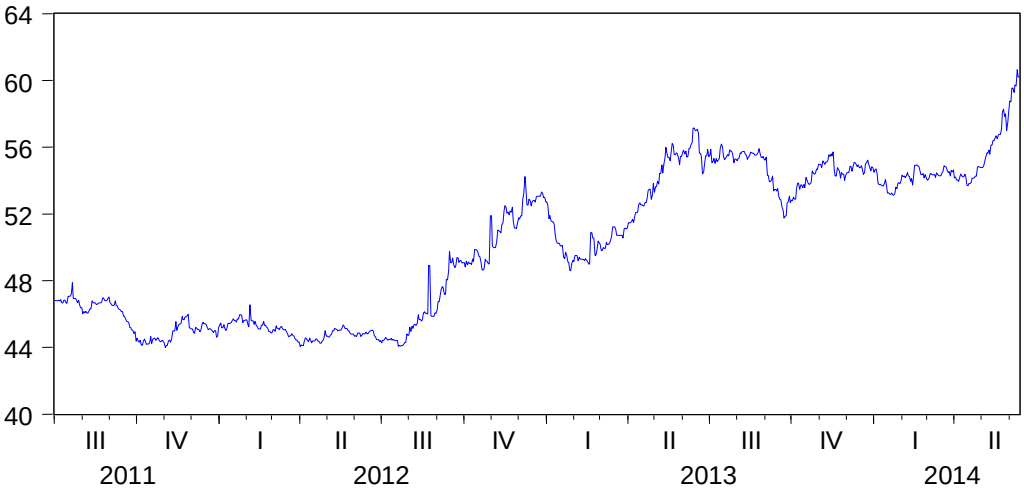
Empirical Analysis

The data about the Gold price and exchange rate for the period from July 2011 to June 2014 is show in the graph:

Gold Price



Exchange Rate



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Since we cannot use non-stationary variables for testing granger causality or for VAR modelling, the stationary of all four series is tested

Unit Root Test of Gold

Variable	Test statistic
Gold price	-0.295981 (0.9907)
Δ gold price	-28.28995 (0.0000)*
Exchange rate	-2.136193 (0.5243)
Δ exchange rate	-25.53710 (0.0000)*

*indicate significance at 1%level
Figures in the bracket are P values

It is clear from the table that both gold price and exchange rate are non stationary in level, but stationary in first differences.

To investigate the nature of relationship between gold price and exchange rate of granger causality test on first difference of gold price and exchange rate has been conducted. The result suggests no causality between gold price and exchange rate.

Granger Causality Test

Null Hypothesis	observations	F-statistics
Δ gold does not granger cause Δ exchange rate	924	0.48407 (.6164)
Δexchange rate does not granger cause Δ gold		1.77989 (.1692)

To assess whether there is any long run relation between spot price and exchange rate we have adopted the Johansen test for cointegration. The test is based on two test statistics namely trace statistics and maximum Eigen value Statistics. Johansen test also confirms the result obtained from Granger causality test.

Table - 15

Test result of Unrestricted Cointegration Rank Test (Trace)

Hypothesis	Eigen Value	Trace Statistics	Max-Eigen value
None	0.004996	6.348549 (.6543)	4.602951 (.7909)
Atmost 1	0.001898	1.745597 (.1864)	1.745597 (.1864)

RESULTS AND DISCUSSION

From analysing the data using Augmented Dickey- Fuller Unit Root Test, Johansen cointegration test and Granger Causality test the results obtained are the following. The Augmented Dickey Fuller Unit Root test is conducted for stationary and the test has concluded that gold price and exchange rate are non stationary but stationary in first difference. Granger Causality test is conducted to known the causality between the gold price and exchange rate. The test result suggests no causality between them. The Johansen co-integration Test also shows the absence of any long run relationship. Thus we conclude that there is no co-integration between exchange rate and gold price.

CONCLUSION

This paper investigated the long run relationship between gold price and exchange rate for a period of three years of daily data from July 2011 to June 2014. The Augmented Dickey Fuller unit root test concluded that gold price and exchange rate are non stationary but stationary in first difference. Granger Causality test concluded that there is no causality between them. The Johansen cointegration test also indicates that there is no cointegration between exchange rate and gold price.

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